

Information requirements of a global EIS: An exploratory macro assessment

By: [Prashant Palvia](#), Anil Kumar, Nadesan Kumar, Rebecca Hendon

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Abstract:

Rapid changes in the world economy and politics have accelerated the drive of businesses into international expansion. Information technology (IT) has made an important contribution in both the facilitation and the driving of a global business. As a result of globalization, senior executives in corporations need the ability to monitor important global information in order to spot problems as well as identify opportunities anywhere in the world. The current executive information systems (EISs) that are receiving heightened attention by both executives and researchers are largely domestic in nature. This paper argues that future executive information systems would have to be increasingly global in scope and would be vital for conducting global business. We call such systems global EISs. An exploratory study has been conducted which identifies, in macro categories, the types of information required by executives in a global EIS, the current level of use of such information, and the sources of such information.

Keywords: Executive information systems; Information requirements; International/Global information systems; Global EIS; Global EIS foundations; Empirical research

Article:

1. Introduction

The irreversible and the steadily growing phenomenon of organizations engaging in global business, and the vast changes in world markets have made a tremendous impact on the use of information technology (IT) and the information needs of these organizations. Information technology has been both an enabler in and driver of the globalization activity. In recent years, several books and articles have appeared [9,10,19,30,33] that address the issues surrounding the global deployment of information technology, and the development of global information systems. It is noteworthy that these writings largely focus on operational and transaction oriented information systems.

At the same time, an increasing number of organizations are implementing executive information systems (EISs), and the interest in such systems is surging [5,6,26,32,35,41-44]. These systems, typically developed for senior executives, are used to access news, stock prices, and information about competitors, customers, key performance indicators, and internal operations. The descriptions of current systems (e.g., as in [5,7,14,18,26,28]) typically have no reference to environmental data/information that is international in scope. It is implicit in these systems that they capture information which is largely domestic (i.e., about a single country, e.g., USA) in its orientation. However, as businesses become global, its senior executives need to not only monitor domestic information within their own country of operation, but also access information which is global in nature and relates to other countries. We will label EISs that are global in scope as Global EISs.

Critical to the development of global EISs is the knowledge of the information requirements of such systems. This exploratory report attempts to capture, in macro categories, the environmental information needs of senior executives when they are involved in making key international business decisions. It also attempts to identify the possible sources of such international information. It is hoped that the findings of the study would be useful in the effective design of future executive information systems. It is the authors' strong conviction that many

future EISs would have to be global in scope in order to be useful in the global economy of the current decade and the next millennium.

In the next section, we review pertinent literature related to executive information systems and build a case for the need for global EISs. In the third section, the study methodology is described. The fourth section reports and discusses the results. The paper concludes with summary observations and suggestions for future research.

2. EIS literature and the need for global EIS

Executive information systems are a relatively new development in MIS; however, much is being written about them in the past five years. Their initial and predominant thrust has been towards the intelligence and problem finding activities of senior executives [8,22,23,33,43]. In some cases and especially more recently, there have been reports of EIS spreading to middle-level management levels and other users [2,8,41,43]. Sometimes, these systems are called second-generation EIS or EIS II.

The literature describes the many benefits of EIS. Chief among these are the strategic benefits to executive users [8,13,22-24]. The strategic value is obtained by the EIS' capability to facilitate the identification of potential problems and opportunities in a timely and orderly fashion. All EIS accomplishes this objective by extracting, filtering, compressing, and tracking massive amounts of critical internal and external data [40,43]. Internal data emanates primarily from the organization's transaction processing systems, and includes data from functional areas like accounting, finance, marketing, production and personnel.

Data external to the organization, the focus of this article, while not readily available is critical to executives and thus an important part of EISs [35,36,41,43]. Access to external information is also called "environmental scanning" [12,16]. According to Ghoshal and Kim [16], environmental scanning is a source of competitive advantage to firms, and one of the underlying reasons in the trend towards global competition. Like internal data, external data can be hard or soft and may require special collection efforts [43]. The primary external data sources noted in the literature are news services, commercial database services (e.g., CompuServe, Compustat, Dow Jones Information Service) containing financial and stock market data, trade journals, customers, marketplace, and competitors [40,42,43]. Together, these sources provide financial, competitor, customer, demographic, environmental and government data. However, the identification of executive information requirements remains a difficult task; several authors have proposed various methods for identifying the requirements [34,42,44].

In practically all EIS literature, the reference to external information relates implicitly to domestic information alone (i.e., within the national borders of the business firm). Information pertaining to competitors, customers, suppliers, demographics, government, and environment is generally included within the confines of a single country. The global facet is virtually non-existent or included only indirectly, e.g., including information about international customers in an EIS [7]. The fact that a growing number of businesses throughout the world, including many in the U.S., are becoming increasingly globally interdependent calls for the development of global executive information systems that will capture global information as well. Several researchers have begun to make a call for globally oriented management support systems [9,11,29,37]. For example, Sauter [37] commented that decision support systems have the potential for even greater impact in assisting in multinational decision making. Recently, Eom [11] described the concept of a transnational management support system (TMSS) that integrates decision support systems, expert systems, and executive information systems. One of the functional requirements of such a system would be global data access. The impressive advances in information technology are finally permitting the development of such systems. For example, Ohmae [29] observed that the telecommunications revolution has opened a vista of possibilities for MNCs in making decisions based on instantaneously available information on global markets. Deans and Kane [9] have described the growth of global online databases in the nineties, which will be vital to the development of global EISs.

Having established the need for global EISs in the future, our goal is to provide a macro categorization of the types of international information to be included in such systems. Several researchers from international

business and inter-national marketing have provided important directions in this regard. For example, according to Murray [27], the key information types are: legal, cultural, political, market structure, economic, scientific, market, financial, and environmental. Ghoshal and Kim [16] studied the use of the following types of information by Korean firms in their scanning activities: competitive, market, technology, regulatory, and resource information and broad issues. They identified sources of information as: customers, bankers, suppliers, agents and distributors, trade publications, trade shows, consultants, and general publications. Keegan [21] formulated a more general classification of information sources: human, documentary, and physical. Many other authors have proposed similar information types and information sources (e.g., [15,31,39]).

3. Research objectives and methods

The research was designed to accomplish the following objectives:

- (1) Identify the types of information required by management in conducting international business, and making strategic global decisions. Based on the literature reported earlier, several information types were identified as being relevant in the conduct of international business (OB). However, it seemed logical and prudent to believe that the same type of information may not be necessarily suitable for every single IB decision. Therefore, in order to provide context to the respondents and add validity to the results, two major IB decision settings were considered for the specification of information types. These decision settings were selected based on literature review and consultation with IB faculty. These decision settings, while not exhaustive of the range of IB decisions, are nonetheless important decisions. The two settings, reproduced verbatim from the study, are:
 - (a) new product or service introduction in an international market,
 - (b) distribution channel expansion into other countries for products or services;
- (2) Describe the priorities attached to the different types of information. In addition to the identification of the information types, it is important to be able to assign priorities to the information types. Further, a comparison of the priority lists for the two settings, would provide additional insights;
- (3) Estimate the frequencies with which the different types of information are used by managers. Once again, any differences in frequencies in the two IB settings will help understand the usage patterns;
- (4) Identify the various sources of global information, and their frequency of use.

A preliminary survey questionnaire which addressed the above objectives was prepared based on the literature review presented earlier. The literature review resulted in the selection of ten variables (macro categories) on which a firm may require information. In addition to seeking data on the ten information types in the context of the two IB scenarios, the questionnaire also asked for demographic data, business strategy, and organizational structure of the firm. The two scenarios provided an additional benefit: they provided a valuable context to the respondents, thus minimizing vagueness and ambiguity in their responses.

Demographic data (firm size, industry type, trading countries), organizational structure, and business strategy may have a potential impact on an organization's global information requirements. Bartlett and Ghoshal [4] described four organizational structures: multinational, global, international, and transnational. We coalesced "international" into "transnational" structure because of the similarities in the two structures [1]. Briefly, a *multinational* firm is one that is a decentralized federation with distributed resources and delegated responsibilities. A *global* firm is characterized by the use of a centralized hub structure wherein assets, resources, and responsibilities are controlled by the parent company. A *transnational* firm is characterized as an integrated network of various highly interdependent parts. The form of organizational structure was determined by asking a straight-forward factual question.

Each firm's predominant business strategy can be classified as defender, reactor, analyzer, or prospector using the typology of Miles and Snow [25]. The *defenders* concentrate on improving internal efficiencies within their domain of operation and do not seek new opportunities outside of their boundaries. *Prospectors* are the opposite in that they use innovation as opportunities for introducing change and gaining an edge in the market. *Reactors* and *analyzers* fall between the extreme types. The strategy information was obtained by an adaptation of the items presented in the instrument by Snow and Hrebiniak [38].

The questionnaire was pretested with several doctoral students and faculty members in order to elicit suggestions, changes, and improvements. Modifications were made on this basis. The final questionnaire was mailed to 200 firms involved in international business in a tri-state area. These firms were listed in a directory compiled by the international business center housed at the authors' University. The questionnaire was sent to the senior executive of the firm's international department. Follow-up letters and phone calls were made to those not responding initially. Thirty seven useable responses were received providing a response rate of 19%.

While a higher response rate is desirable in any research endeavor, we believe this response rate is adequate given the exploratory nature of the study. This research is among the first few empirical investigations of EIS in the international context, and the primary purpose is to identify the broad information categories. As pointed out by Baroudi and Orlikowski [3], a small sample is quite suitable for such exploratory analysis. Moreover, for quantitative analysis, samples in excess of thirty are considered adequate for most research [17]. Incidentally, the homogeneous sampling method used in the study (i.e., involving senior strategic managers of firms with documented international activity) has the effect of actually improving the quality of data and increasing the power of subsequent statistical tests.

4. Results and discussion

We first provide a description of the firm characteristics in the target sample as well as the respondent sample (see Table 1 for details). It should be noted that, for the most part, the characteristics of the target sample and the respondents are similar. The one difference that stands out is that the respondent firms are larger than the target firms. But this actually helps the study's focus, as it was revealed by some of the non-respondents in follow-up contacts that many of the smaller companies maintained only a token presence in international markets.

Table 1
Sample characteristics

Characteristics	Target sample	Respondent sample
Number of employees:		
0–100 employees	54%	35%
100–300 employees	25%	22%
300–1000 employees	15%	35%
Over 1000 employees	6%	8%
Markets:		
Canada	11%	11%
Mexico	7%	11%
UK	8%	9%
Saudi Arabia	3%	5%
Australia	4%	2%
Industries:		
Manufacturing	74%	80%
Service	13%	13%
Distribution/Wholesaler	13%	7%
Respondent title:		
Vice-President	Not Applicable	8%
President		8%
Sales/Mktg. Manager		26%
International Mgr.		30%
Other Senior Mgr.		28%
Sales volume (in millions):		
\$3.00–\$12.00	Not available	24%
\$12.00–\$50.00		27%
\$50.00–\$100.00		14%
\$100.00–\$200.00		8%
Over \$200		5%
Not reported		22%

The two hundred firms, headquartered in the U.S., conducted business in over twenty countries. The major countries represented both in the target and the respondent samples were: Canada, Mexico, U.K., Saudi Arabia, France, and Japan. Majority of the firms among the respondent firms were in manufacturing and included industries such as food, sporting goods, electrical equipment, consumer goods, industrial products, and defense products. Service industries included information and telecommunication services, medical services, and consulting services. The information to the questionnaire was generally provided by a senior executive or a senior manager, thus making it highly relevant. Finally, the respondent firms exhibited a good range of variety in terms of organizational structure and business strategy. Twenty-two firms provided organizational information; of these, 8 (21.6%) were multinational, 8 (21.6%) were global, and 6 (16.2%) were transnational. Thirty-four firms provided business strategy information; of these, 16 (43.2%) were defenders, 8 (21.6%) were analyzers, 7 (18.9%) were prospectors, and 3 (8.1%) were reactors.

4.1. Types of required information

The literature cited earlier provided different types of information as well as specific information items from other countries that might be useful for conducting international business. For exploratory analysis, it was possible to group these information elements into major macro categories. Ten information type categories were formed, as listed in Table 2.

Table 2

International information type categories

Demographics (age, education, income, etc. of target population)
Political risk (government stability, security, etc.)
Cultural/Social (values, norms, practices, etc.)
Economic (economic indicators, GNP, per capita income, etc.)
Market (demand, existing products, consumer taste, etc.)
Natural resources (oil, metals, etc.)
Infrastructure (highways, utilities, telecommunications, etc.)
Competitor info (marketing, manufacturing, R & D capabilities, etc. of rivals)
Finance (currency fluctuations, interest rates, availability of capital, etc.)
Government regulation (incentives, barriers, etc.)

Table 3

Information required for new products or service introduction

Information requirements	Priority (averages)
Demographics (age, income etc.)	1.63
Political risk (govt. stability etc.)	2.45
Cultural/Social (value, norms)	1.52
Economic (GNP, per capita)	2.22
Market (demand etc.)	2.83
Natural Resources (oil etc.)	1.25
Infrastructure (highways etc.)	1.7
Competitor information (mfg etc.)	2.69
Finance (currency, fluctuations)	2.54
Govt. regulation (barriers etc.)	2.58

Table 4

Information required for distribution channel expansion into other countries

Information requirements	Priority (averages)
Demographics (age, income etc.)	1.53
Political risk (govt. stability etc.)	2.53
Cultural/Social (value, norms)	1.68
Economic (GNP, per capita)	2.32
Market (demand etc.)	2.88
Natural Resources (oil etc.)	1.18
Infrastructure (highways etc.)	2.03
Competitor information (mfg etc.)	2.77
Finance (currency, fluctuations)	2.49
Govt. regulation (barriers etc.)	2.65

Respondents were asked to indicate the priority of each information type (i.e., the impact of the information type on the strategic planning activity of the firm) for each of the two international business scenario described earlier. Priority was to be indicated as high, medium, low, or no impact. For summary reporting of the results, high priority was assigned a value "3", medium priority a value "2", low priority a value "1", and no impact a value "0" ². An average priority value was computed over all respondents for each information type. These averages for the IB scenarios are shown in Tables 3 and 4. Average ratings greater than 2 would imply significant priority placed on the information.

According to both tables, market information about other countries received the highest priority. This information is vital to an international business, as it provides knowledge about product demand, existing products, and consumer taste. The next priority information is about competitors, their capabilities and strategies. Other information types considered having a notable impact, are: government regulation, financial information, information on national economy, and political risk information. It is noteworthy that these six

information types were rated significantly high (i.e., average rating > 2) for both decision scenarios. While, no statistical tests have been conducted, it seems apparent that on an overall basis, there are only minor differences between the types of information required for the two scenarios. This observation, while contradicting our earlier expectation, should be comforting to researchers and system designers in that they can seek core pieces of information in the design and development of global EISs. In other words, the preliminary evidence seems to suggest that there is a large core body of information that can be incorporated across several global EISs, and therefore customization efforts need not be time-consuming or massive.

There is one difference in the information ratings of the two scenarios, however. Information on infrastructure (i.e., highways, utilities, telecommunications, etc.) was considered less important in the new product/service introduction scenario (average rating of 1.70) than in the distribution channel expansion scenario (average rating of 2.03). This observation does not necessarily negate the previous "commonality" remark, as the "distribution channel expansion" scenario is somewhat more specific and clearly depends on the national infrastructure.

Table 5
Frequency of use of information (new products/services)

Information requirements	Highest frequency	Next highest frequency
Demographics	Infrequently (51.4%)	Yearly (32.4%)
Political risk	Monthly (29.7%)	Infrequently (27.0%)
Cultural/Social	Infrequently (54.1%)	Yearly (13.5%)
Economic	Yearly (37.8%)	Quarterly (21.6%)
Market	Quarterly (29.7%)	Yearly (27.0%)
Natural resources	Infrequently (45.9%)	Yearly (24.3%)
Infrastructure	Infrequently (40.5%)	Yearly (32.4%)
Competitor information	Monthly (29.7%)	Quarterly (27.0%)
Finance	Monthly (35.1%)	Quarterly (18.9%)
Government regulation	Monthly (29.7%)	Quarterly (27.0%)

4.2. Frequency of use of information

Along with the types of information deemed important, it is also instructive to examine the degree and amount of use of such information. Respondents were asked to indicate the frequency of the use of each information type on the following scale: daily, weekly, monthly, quarterly, yearly, and even less frequently. The results show that for most firms, information needed to be accessed on a monthly, quarterly, yearly, or a less frequent basis. This is consistent with the literature where many executive information needs are described as non-routine and ad hoc [40,42]. However, information when needed, needs to be accurate and timely [40,43]. Certainly, accuracy and timeliness of information are among the main benefits of an EIS. Furthermore, an EIS has the affect of multiplying the frequency of use, as has been the experience with the use of internal information in many current EISs [2,18,40].

For each information type in the new product/service introduction scenario, the two periods with the highest frequency and the second highest frequency are shown in Table 5 (e.g., economic information was needed by 37.8% firms on a yearly basis, and 21.6% firms on a quarterly basis). Table 6 shows the same results for the distribution channel expansion scenario. Again, there is a remarkable similarity in the two sets of results. The information types which are needed most frequently, i.e., monthly or quarterly, are about political risk, market, competitors, finance, and government regulation. The less frequently used types of information are about demographics, cultural/social aspects, national economy, natural resources, and infrastructure. There are seemingly two reasons for the differences in frequency of access. First, information that is more critical for international business is accessed more frequently. This is the case, for example, for market information and competitor information which were rated of highest priority in our survey. A second reason is that the information that might change more frequently is accessed more often and vice versa. For example, national economy, infrastructure, demographics, cultural and social patterns, and infrastructure are unlikely to change on a monthly or even quarterly basis.

Table 6
Frequency of use of information (distribution channel expansion)

Information requirements	Highest frequency	Next highest frequency
Demographics	Infrequently (48.6%)	Yearly (18.9%)
Political risk	Monthly (29.7%)	Yearly (27.0%)
Cultural/Social	Infrequently (45.9%)	Yearly (27.0%)
Economic	Quarterly (32.4%)	Yearly (24.3%)
Market	Quarterly (32.4%)	Monthly (27.0%)
Natural resources	Infrequently (43.2%)	–
Infrastructure	Infrequently (27.0%)	Yearly (24.3%)
Competitor information	Monthly (29.7%)	Quarterly (24.3%)
Finance	Monthly (27.0%)	Quarterly (24.3%)
Government regulation	Quarterly (29.7%)	Monthly (21.6%)

Table 8
Sources of information (overall)

Source	Percent frequency
Published trade/general/govt. publ.)	92
Personal contacts	92
Media (radio/TV/newspaper etc.)	84
Suppliers/Customers/Trade assns.	84
Conferences/Trade shows	84
Chambers of Commerce	76
Business travels	73
Info. brokers/Consultants	43
Online databases	22
Academic institutions/Research labs.	19

Table 7
International information sources

Published sources (e.g., trade, general, and government publications)
Media (radio, TV, newspapers, and magazines)
Online databases
Information via business travels
Personal contacts
Government offices (chamber of commerce, embassy, patent office)
Academic institutions and private research laboratories
Information brokers and consultants
Suppliers, customers, and trade associations
Conferences and trade shows.

4.3. Sources of information

Based on the literature review and pretesting of the questionnaire, ten types of information sources (Table 7) were identified as potentially relevant for obtaining international business information.

As information can and is usually obtained from multiple sources, respondents were allowed to check multiple sources. Table 8 shows the percent frequency of use of each information source. The two highest sources of information are published data in official publications and personal contacts. Other sources of information that are also considered important are media, external business entities such as suppliers, customers, and trade associations, chambers of commerce, embassies, conferences, and trade shows.

It is apparent that many of the widely used sources of international information are rather informal, personalized, and soft [43]. While personal and informal contacts provide invaluable insights, such a high reliance on them may also point to the lack of easily accessible sources of hard information. Moreover, the low use of online databases also indicates the lack of such support. These observations together imply that the development of computerized databases and associated interface support (i.e., a global EIS) would be welcome by international business managers.

It is also interesting to examine the sources of information by information type, as shown in Table 9. While, in general, the sources of information are similar by specific information type, there are some noteworthy differences. For most information types, the top sources are in the following order: official publications, personal contacts, external business entities (suppliers, customers, trade associations), chambers of commerce and embassies, and business travels. However, personal contacts is the primary source of information on cultural and social variables, market, and competitors. Given that information about the market and competitors was rated the top two in terms of strategic impact and priority, this finding assumes further significance. Essentially, what is being said is that the information that is needed the most is being acquired largely by informal and personal sources. Once again, a reasonable extrapolation is that any attempts to provide such information in a user friendly and easily accessible manner in the form of a computerized EIS will be of great value to international business executives.

Table 9
Sources of information (percentage usage)

Information type	Published	Media	Online data	Bus. travel	Pers. contact	Ch. of comm.	Acad. inst.	Info. brokers	Supp.	Confr.
Demographics	68	27	5	41	54	35	3	14	49	43
Political risk	62	60	3	41	54	54	5	8	46	19
Cultural/Social	46	51	0	41	54	43	8	3	43	24
Economic	76	46	5	46	46	57	5	8	46	30
Market	62	22	8	49	54	46	8	16	68	62
Natural resources	49	8	0	16	16	24	3	8	16	11
Infrastructure	57	16	0	30	41	41	0	11	22	19
Competitor information	46	32	11	43	62	30	3	24	73	73
Finance	62	43	3	19	27	32	3	8	22	5
Government regulation	73	30	5	19	41	54	11	19	38	22

5. Conclusions and future research

We have argued in this article that businesses now need to incorporate a global dimension in the design of their executive information systems. Such global EISs will incorporate important international information that will be critical to executives of multinational corporations and global businesses in order for them to conduct business and compete globally. The article provides some useful findings for the development of global EISs. Based on responses from a sample of senior managers, it has developed a broad and prioritized list of core information categories that should be part of an EIS database. The study also identifies the sources of the various information types that international managers currently use. The findings generally support the contention that international information is neither readily nor easily available, thus corroborating the need for global EISs.

It is to be stressed that our results are broad and exploratory. Future research in EIS can take multiple directions. One obvious line of research is to further detail and explicate the information requirements of a global EIS. The possibility of a contingency model should be explored where in-formation requirements are influenced by key organizational variables, such as industry, size, organizational structure and organizational strategy. Another line of worthwhile pursuit is to study the components of a global EIS. For example, while we have focused on external global information, other components include telecommunications structure, user interface, internal data, and modeling capabilities. Finally, researchers should attempt to find the impact of global and country variables on the development, implementation, and use of global EISs.

As a concluding note, we believe that we have highlighted an important and emerging area in MIS research and development. We, therefore, leave the readers with the following call:

Given the proliferation of globalization activities in American business, as well as businesses worldwide, and the spectacular advances in information technology, it is now an appropriate time for the study and development of global management support systems. At a minimum, such systems include global executive information systems (GL-EISs), and global decision support systems (GL-DSSs). Additionally, such systems may include global expert systems and global group support systems. Businesses (especially, multinational corporations) would find it profitable, and even necessary in order to compete, to invest in the development of such systems. At the same time, educators and researchers have a responsibility to conduct research and teach relevant issues pertaining to global management support systems.

Notes:

1 While these factors were measured and are described elsewhere, they were not analyzed for their informational impact due to the exploratory nature of the study. However, such studies in different contexts have begun to appear. For example, recently some authors have studied the fit between Organizational structure and IT configuration, and its impact on IT and organizational performance [1,20].

2 The authors realize that conversion of rank data into interval data is somewhat arbitrary. However, it makes reporting far simpler and results are useful if one can make the reasonable assumption that high, medium, and low priorities are about equidistant. In any case, the results are indicative of general trends.

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